IN THE SPECIFICATION

The paragraph beginning at page 2, line 24 is amended as follows:

In the prior art, one single bias pulse is applied to each microbolometer in the array in each frame time. Application of a single bias pulse in each frame time can result in a temperature increase in the microbolometer over and above the heating effect of the incident radiation. Since, by necessity, such bias pulses have to be much shorter in time than the frame time, the heating effect is very rapid. Thus, when one bias pulse is applied to each microbolometer in the array in each frame time, the temperature of the microbolometer can initially rise rapidly for a short time equal to the bias pulse duration, and then fall for the reminder of the frame time. The variation in temperature the signal level during each bias pulse due to the temperature rise and fall can typically be many times greater than the signals caused by the incident radiation. The electronic circuits receiving the signals must be designed to receive ~~possess~~ a much larger variation in signal ~~dynamic range~~ than would be required for the radiation signal alone. This adds to the difficulty in designing and operating such circuits.

The paragraph beginning on page 3, line 18 is amended as follows:

The existing method for obtaining higher sensitivity and improved performance in a microbolometer is to increase the magnitude of the bias pulse. However, higher bias pulse magnitudes produce correspondingly higher heating pulses and temperature variations in the microbolometer. This increase in heating pulse and temperature variation requires the circuits, receiving the microbolometer signals, to receive a significantly greater variation in signal level ~~increases the dynamic range requirement of the circuits receiving the microbolometer signals~~.

Therefore, there is a need in the art to design and operate ROICs such that they operate at a significantly lower NEP and NETD values from a microbolometer array, to improve the sensitivity and performance of the microbolometer arrays. Also, there is a need in the art to reduce the microbolometer temperature variations within the frame time caused by the application of bias pulse heating effect.

The paragraph beginning on page 7, line 15 is amended as follows:

C3

Graph 400 also illustrates temperature variation 440 of each microbolometer caused by the application of the bias pulse 430. It can be seen from the graph 400 that the temperature variation 440 of each microbolometer in the array 110 is quite significant in each frame time 410. This is because the heating effect of each bias pulse 430 itself causes the temperature to rise rapidly in each microbolometer as shown in the graph 400. This temperature rise is over and above the heating effect of the incident infrared radiation 130. Since by necessity, as described above, the time duration of each bias pulse 430 is significantly shorter than the frame time 410, the heating effect of each bias pulse 430 is very rapid. Thus, when one bias pulse 430 is applied to each microbolometer in each frame time 410 as shown in Figure 4, the temperature of each microbolometer in the array 110 initially rises rapidly 450, for a short time equal to the time duration 420 of the bias pulse 430. Then the temperature starts to fall 460 during the remainder of the frame time 410 as shown in Figure 4. The variation of signal level caused by this temperature variation 440 is significantly greater than the signals generated by the incident infrared radiation 130. Therefore, the ROIC 115 receiving such varying signals are designed to possess a much larger <u>variation in signal level</u> ~~dynamic range~~ than would be required for the signals generated by the incident infrared radiation 130 alone. The requirement of a large dynamic range by the ROIC 115 adds to the difficulty in designing and operating the ROICs.

The paragraph beginning on page 8, line 1 is amended as follows:

C4

Figure 5 is a graph 500 illustrating one embodiment of operating each of the microbolometers in the array according to the teachings of the present invention. Instead of a single bias pulse 430 applied in the prior art as shown in Figure 4, a series of two or more <u>shorter-duration</u> bias pulses 510 are applied substantially sequentially to each microbolometer in the array 110 within the frame time 410. The application of <u>two</u> ~~one~~ or more bias pulses 510 to each of the microbolometers within the frame time 410 is referred to as "fast scanning."

The paragraph beginning on page 8, line 8 is amended as follows:

C5

Again, assuming an array size of 'R x C', and a frame time of 'T', each microbolometer in the array 110 could receive two or more bias pulses 510 having a time duration not exceeding

C5 cont'd

(T/(N x R x C)) within the frame time 410. Alternatively, several microbolometers could be simultaneously provided with two or more bias pulses 510. Because, fast scanning requires more frequent bias pulses, fast scanning is most easily applied to small two dimensional arrays and linear arrays.

The paragraph beginning on page 8, line 21 is amended as follows:

C6

The reduced temperature variation allows the use of electronic circuits with improved ~~higher~~ performance. Another reason for the performance improvement provided by the fast scanning method 500 shown in Figure 5 relative to the prior art method of applying one bias pulse 430 to each microbolometer in the array in each frame time 410 shown in Figure 4, as can be understood as follows: If the number of bias pulses N applied in each frame time to each microbolometer in the array 110, is greater than 1, and each is N times shorter in duration than the single bias pulse 430 that could be applied, then the noise bandwidth of the signals is increased to a higher frequency limit by a factor of N. Each signal therefore has $N^{1/2}$ greater white noise, but there is no increase in the 1/f noise, since such low frequency noise is assumed to lie substantially within the noise bandwidth for all values of N. If the N signal values from each microbolometer in each frame time are used to form an average signal value, the rms white noise is reduced to the N=1 value, and the low frequency noise rms value for noise frequencies approximately between the frame repetition rate frequency and the bias pulse repetition frequency is approximately reduced by the factor of $N^{1/2}$ below the N=l value. Thus, the final signal value that is obtained in each frame time has a reduced amount of noise if N>1. The reduced noise produces corresponding improvement factors in the array performance (reduced values of NEP and NETD).

The paragraph beginning on page 10, line 22, is amended as follows:

C7

Figure 9 illustrates major portions of an infrared radiation detector apparatus 900 and their interconnections according to the present invention. The infrared radiation detector apparatus 900 includes the microbolometer array 110, ROIC 115, ~~a measuring circuit 950~~, an output circuit 950, and a digital image processor 340. As shown in Figure 9, ROIC 115 includes a timing circuit 920, a measuring circuit 930, and a computing circuit 940.

The paragraph beginning on page 11, line 6 is amended as follows:

In some embodiments, the two or more bias pulses 510 applied to each microbolometer in each frame time are substantially equal in magnitude. The two or more bias pulses 510 can be substantially equally spaced in time within the frame time 410. The two or more bias pulses 510 can be voltage bias pulses. The two or more bias pulses 510 can be current signals. The number of the two or more bias pulses 510 can be approximately in the range of about 2 to 100 bias pulses. The two or more bias pulses 510 have a time duration of approximately in the range of about 0.1 to 20 microseconds.

The paragraph beginning on page 11, line 13 is amended as follows:

The measuring circuit 930 is coupled to the microbolometer array 110 such that the measuring circuit 930 can measure two or more resulting signals associated with each of the two or more bias pulses 510 applied during the frame time 410. The computing circuit 940 is coupled to the measuring circuit 930 so that the computing circuit 940 receives the two or more resulting signals from the measuring circuit 930 and computes an average signal value for each of the received two or more resulting signals from the measuring circuit 930. Then the output circuit 950 coupled to the computing circuit 940 produces an output signal based on the computed average signal value associated with each of the microbolometers in the array 110 such that the output signal improves performance, sensitivity, and facility of operation of the microbolometer. The measuring circuit 930 can measure two or more resulting signals associated with each of the two or more bias pulses 510 and can individually control the two or more resulting signals. In some embodiments, the signal circuit can apply corrective signals to produce coarse non-uniformity correction.